

interval, May 3–July 3, 1877; in the first column are the daily rates given by the observations, and in the second those resulting from the above formula :—

		s.	s.
May 3–11	...	0'07	0'02
11–25	...	0'00	0'01
25–31	...	0'04	0'04
May 31–June 8	...	0'03	0'06
June 8–15	...	0'04	0'01
15–19	...	0'20	0'23
19–22	...	0'15	0'09
22–26	...	0'10	0'11
26–29	...	0'09	0'05
June 29–July 3	...	0'05	0'04

Dr. Winnecke remarks that upon the experience in the interval 1875–78 he believes the performance of the clock has not beer hitherto excelled, and congratulates himself upon the possession of a work of art.

### PHYSICAL NOTES

Who did discover the attraction caused by the vibrations of sounding bodies? Prof. Guthrie and Herr Schellbach of Berlin, discovered it independently of each other nearly ten years ago. But Guyot had observed the phenomenon before them; and in a paper in the *Philosophical Magazine* for 1849, by Mr. Reuben Phillips, on the "Electricity of Steam," the attraction caused by vibration is recorded as a new fact.

THE transverse vibrations of metallic cylinders open at one end have been recently studied by Herr Fenkner, at Marburg (*Wied. Ann.*, No. 9). The following results were arrived at: The vibration-numbers of the tones of such cylinders are independent of the height of the cylinder. The vibration-numbers of the corresponding tones of two such cylinders are inversely as the squares of the circumferences (or radii), and they are directly as the thicknesses of metal.

PROF. TÖPLER, of Dresden, is well known to physicists by his researches on singing flames and by the induction electric machine which bears his name. Toppler's machine, of which several examples were shown in the Loan Collection at South Kensington in 1876, resembles in form the more familiar machine of Holtz, and is based upon similar principles. Prof. Töpler is at present engaged upon the construction of a larger machine having twenty rotating plates; and which is capable of generating much larger quantities of electricity. This machine bears a close resemblance to the variety of Holtz machine shown before the Physical Society a few months ago by Mr. W. J. Wilson, and to that recently constructed by Mr. Ladd, which also had a number of plates rotating on a common axis.

APPARATUS for projection, like the magic-lantern, always gives inverted images. Most commonly this causes no inconvenience, for one can invert the object; but there are cases in which this cannot be done, and the only resource is to rectify the image. To obtain this result, M. Dubosec (*Journal de Physique*, October) has recently conceived the idea of receiving the rays which would go to form the inverted image on a prism with total reflection. Suppose an isosceles rectangular prism, placed with hypotenuse parallel to the optic axis of the lens by which the rays from the object are made convergent, and so as to receive the cone of rays on one side; refracted in the prism, the rays reach the hypotenuse at an angle greater than the limiting angle, are totally reflected, and sent to the second side of the prism, where they are refracted at the same angle as on entrance, and then go to the screen, forming an image which corresponds in position to the object. As it may be desired to rectify the image in some other plane than the vertical, it is found advantageous to mount the prism in a tube forming part of the projection apparatus, and capable of being turned round the direction of the ray.

IN a recent memoir on the plasticity of solid substances (*Rev. Scient.* xi, 1879), Signor Marangoni, with reference to Bottomley's experiment dividing ice with a wire, groups plastic substances in two classes. Those of the first class can be cut in two with a metallic wire like ice, and they can also be considerably deformed. Such are plastic clay, fresh soap, camphor, black pitch. Substances of the second group give two lamellæ on the two sides of the cutting wire, which then come out of the slit, become notched and bend over, resembling leaves; to this class belong vegetable Japanese wax, dry Marseilles soap, tallow and stearine, but above all, yellow wax and paraffin. The

occurrence of these phenomena depends largely on the diameter of the wire and on the temperature. For yellow wax, wires of  $\frac{1}{2}$  to 1 mm. diameter, for paraffin  $\frac{1}{2}$  to 0'9 mm. are necessary. With the former, the leaves are formed between  $-8^{\circ}$  and  $40^{\circ}$ , with paraffin (melting at  $43'5''$ ) only up to  $15^{\circ}$ . To produce the lamellæ, different weights should be hung to the wire in different cases. The lamellæ are very similar to those separated from rails when a locomotive with strong brake applied, goes quickly down a steep incline.

THE forms produced in the phonograph by utterance of the Italian alphabet are studied in a recent paper by Signor Fautrier (*Atti del Aten. Ven.* [3], I., 1879). The vowels uttered in the A note of the violin (435 vibrations) gave generally three-pointed groups, presenting certain differences. With regard to the consonants, it appeared that with the exception of *l*, *m*, *n*, and *r*, which give characteristic impressions, they only modify the form of the impression of the following vowel, and especially at its limits. Signor Fautrier adds some general considerations, especially on the intensity of the "klangs" given by the phonograph, and the theoretical significance of the apparatus.

M. GASTON PLANTÉ, whose researches on voltaic electricity, especially on the construction of secondary batteries and on the phenomena of their discharge have been from time to time laid before the readers of NATURE, has just published the first instalment towards a second volume. The forty pages or so of this brochure treat of the effects obtained with M. Planté's rheostatic machine.

DR. KÖNIG, the well-known constructor of acoustical apparatus has just completed a new instrument which promises to be of great interest and importance. Dr. König has long maintained, in opposition to the theory of Helmholtz, that the "combinational" or "difference" tones produced by the simultaneous sounding of two simple tones of different pitch are the result of very rapid "beats." The new instrument, which has not yet been seen outside M. König's *atelier*, is a kind of modified syren which puts the question at issue to a direct and crucial test.

WE learn that Prof. Silvanus Thompson is engaged upon a monograph upon the subject of Binaural Audition, which will embrace the whole existing literature of the subject. The work will not be published before next spring.

THE magnets employed in Gower's form of the Bell telephone are of unusual strength. It is stated that the steel of which these magnets are constructed is made from the iron of Alvarre, which, though a particularly bad iron for most purposes, makes a steel unsurpassed for magnetic apparatus.

THE phenomena which occur when the retina is struck by intermittent coloured light (alternating with total darkness) have been recently studied by Signor Cintolessi (*Ann. di Ophthalmol.*, II. and III., 1879). With a certain velocity of intermissions the field of vision appeared at first still and regular in the colour of the active light. The state is gradually changed, and, e.g., red passes by orange, yellow, and green, into a saturated blue-green, after which there is a return by the same colours to red, and so on in periodic change. This phenomenon of a periodic change with the complementary colour the author also describes in the cases of green and blue. The velocity of intermissions must reach 0'11 sec. for red, 0'14 for green, and 0'15 for blue light. In his theoretical views Signor Cintolessi has recourse partly to the Young-Helmholtz hypothesis, partly to Plateau's oscillation theory, and partly also to the photo-chemical properties of the retina.

IT has been noted recently by M. Jannetaz that, if a fine needle be turned round on a cleavage plate of gypsum (1 mm. to 2 mm. thick) so as to produce a small hole, and then be gently pressed into the plate, a separation occurs, surrounded by Newton's colour-rings, and having the form of an ellipse. The major axis of this ellipse makes an angle of  $49^{\circ}$  with the fibrous fracture, and its length is to that of the minor axis as 1'247 to 1. This ellipse has the same orientation and relative size as that of the propagation of heat in gypsum. Further, the larger axis corresponds with the direction of greatest resistance to bending, and the greatest elasticity.

EDISON's new electromotor, with which he proposes to drive sewing-machines, watchmakers' lathes, and other light machinery, has an armature resembling that of a Siemens dynamo-electric generator, but placed longitudinally between the limbs

of a horse-shoe-shaped electro-magnet. A similar disposition was previously employed by M. Marcel Deprez in the excellent little electromotors shown by him before the French Physical Society last year.

IN the latest pattern of telephone transmitter sent by Mr. Edison to this country, the button of compressed carbon derived from paraffin-smoke has been abandoned in favour of another device. A small rod of ordinary hard carbon, of the quality used in producing the electric light, is mounted behind a mica disk and adjusted in loose contact with a light spring faced with platinum. This arrangement is therefore nothing more or less than a *microphone* attached to the back of a disk which receives the vibrations of the voice.

AT a late meeting of the Académie des Sciences, M. Warden made a suggestion to substitute nickel for steel as a material for compass needles. M. Warden adopts a circlet of the metal of a form similar to that devised by M. Duchemin. When the apparatus was submitted under the direction of the Ministère de la Marine to a comparative trial with that of M. Duchemin, it was found to be decidedly inferior for nautical purposes; for the oscillations of the magnetised circlet are extremely slow, owing to the comparatively feeble intensity of magnetisation of nickel.

### GEOGRAPHICAL NOTES

AT the last meeting, October 15, of the Russian Geographical Society, the Secretary, M. Sreznevsky, read a detailed report on the geographical work done during the past summer. After having spoken of the gallant geographical feat of Prof. Nordenkjöld, he sketched the results of the expeditions of Col. Prshevsky, MM. Potanin, Alferaki, and Pyetsoff, and of the expedition engaged in exploring for the Central Asian Railway. As to ethnography and statistics, the secretary mentions the researches by M. Kuznetsoff in Western Russia, by M. Syrkou in Bulgaria, the anthropological researches of M. Meredlenovsky in the Crimea, M. Polyakoff in the Ural Mountains and Caucasus, M. Kibalchich on the banks of the Dnieper, and M. Mielucho-Maclay in Australia. As to this last, the Society engaged him to return to Europe, for the publication of the very rich results of his explorations, but he preferred to take part in a zoological exploration undertaken by Australian naturalists. The pecuniary position of M. Maclay is a very critical one. After having undertaken his extensive travels without sufficient means, he has received from the Society about 7,000 roubles, which sum was certainly quite insufficient to meet the great expenses necessitated by these travels. Now he has contracted debts for about 15,000 roubles at the Singapore bankers, and the Society seeks private subscriptions, the means for paying these debts, in which it is supported by the opinion of the whole of the Russian press. Finally Prof. R. Lentz made a communication on the labours of the International Conference in the Meteorology of the Polar regions. The Geographical Society will take an active part in the organization of the meteorological stations in these regions.

THE *Moskovskiya Vedomosti* has received the following information as to the Amu-darya expedition, dated Katty-kourgan, October 19. At Termez the expedition was divided into two parts: one has gone in boats down the Amu to Fort Petro-Alexandrovsk, the other through Surkhan and Rafiuaghan rivers to the Vaksh river. The results of the expedition are important: it has explored the Amu-Darya throughout its length, and its two branches, the Vaksh and the Pyandj rivers, for fifty miles above their junction. The topographers have prepared maps of these parts of the two rivers, and completed the maps of the Amu by several details; several latitudes and longitudes are determined astronomically, and zoological collections obtained. A levelling of the Amu is made up to Chardjuy. We notice the appearance of a Russian work by M. Lokhtin, "The Amu-Darya River and its former Connection with the Caspian." It contains a description of the river, a sketch of the historical data as to the Amu, and a review of the hypotheses as to the causes of the changes of its bed; it is accompanied by a map. The third, fourth, and fifth volumes of the "Report of the Amu-Darya Expedition," contain reports by M. Zuboff on hydrographical works in the lower parts of the Amu-Darya; by M. Dorandt, on the astronomical, magnetical, and hydrometrical measurements; and by Prof. Schmidt, on the slime of the Amu River.

THE death, from paralysis, in India, is announced, of Major Herbert Wood, author of a well-known work on the Aralo-

Caspian Region, on the hydrography of which he contributed several papers to this journal.

THE last number of the *Izvestia* of the Russian Geographical Society, contains the proceedings of a meeting of the Society in October, 1878, and several interesting papers:—By M. Prshevsky, on the observations of Dr. Richthofen; by K. Scharnhorst, on the barometric measurements of heights in Central Asia; by M. Mayeff, on the upper parts of the Amu-Darya, according to the description of Ibn-Dast; and by M. Mielucho-Maclay, on the Agomes Islands. The notes contain information as to the travels of MM. Prshevsky, Nordenskjöld, and Grigorieff. In the note by Colonel Scharnhorst, on the barometrical measurements of heights made by M. Prshevsky during his journey to Lake Lob-Nor, the measurements being calculated by comparison with barometrical observations at Nukus and at Omsk, the heights of which above the sea-level are exactly known from geodetical measurements, they are trustworthy, and the error does not exceed 100 feet. The height of Tashkend, calculated by comparison of six years' barometrical observations with those made at Omsk, Kazalinsk, Nukus, Petro-Alexandrovsk, Baku, and Astrakhan, is 1,516 feet. The other places of general interest are: Kuldja, 2,080 feet; the passes across the Narat and Yulduz Mountains, 10,370 feet and 10,040 feet; the junction of Khabtragay and Baltagay Rivers, 5,320 feet; the town of Kurl, 3,240 feet; Lake Lob-Nor, 2,500 feet; Lake Sayram, 6,920 feet; and Guchen, town, 2,310 feet.

WE are glad to notice the appearance of an "Annuaire for Turkestan" (*Turkestanskiy Kalendar*) for 1880, which contains much useful information as to the mineral riches of the country, its meteorology, financial situation, and statistics, besides a route-map and a map of the general-governorship of Turkestan. We learn from this Annuaire that Turkestan possessed in 1877 only thirty-five schools, with 1,848 scholars.

THE November number of the Geographical Society's periodical contains three short papers: Notes on the Topography of the Sierra Nevada of Santa Marta, U.S. of Columbia, by Mr. F. A. A. Simons; Exploration of Oregon in 1878 by the Wheeler Survey; and Pévtsoff's Expedition in North-West Mongolia, by Mr. E. D. Morgan. The first-named is illustrated by a map, which is not particularly well lithographed. The geographical notes, however, are the chief feature of the number. The Dutch Arctic Expedition claims the place of honour, and two pages are devoted to Dr. Holub's career. There is also a long account of the native territories south of the Zambesi, abridged from a report to Sir Theophilus Shepstone, which embodies information hitherto unattainable, and the more valuable as it has been revised by Dr. Holub. The exploration of the Swat River by the *Mullah* is recorded. The concluding thirteen pages are taken up with notes on new books and new maps, the map part bearing a close resemblance to a catalogue.

MR. STANFORD has published a new Library Map of the World, on Mercator's projection. The size is 5 feet by 3 feet, and has several new and admirable features. The currents in the ocean are shown by strong blue waved lines. The areas occupied by these currents, which are chiefly caused by the great periodical winds, have an oscillating boundary or limit, as waved lines are better calculated to indicate this, than the firm and sharply defined lines frequently used. A few of the lines in each current have arrow heads to indicate the direction. Figures in blue upon these waved lines, give the maximum and minimum rates in nautical miles per twenty-four hours. These are selected, we believe, from innumerable observations that have been registered and examined by Captains Evans and Hull of the Hydrographic Department, and published in their invaluable "Wind and Current Charts." The drift currents in the Indian Ocean and China Sea change with the Monsoon winds, and in the chart they are shown as they flow during the south-west monsoon, which blows from April to September. The trade and monsoon winds are named over the map in red letters, and the areas over which they generally blow are tinted in colours. The areas over which north-east winds blow are coloured blue, the areas for south-east winds pink; other areas are differently coloured in accordance with the particular direction of the winds which blow over them. A graduated scale at either side of the chart shows the sun's progress to and fro between the tropics; to the left of the chart the sun's vertical action may be traced as he proceeds northward to the Tropic of Cancer, and to the right, his return journey southward to the Tropic of Capricorn. Dates are given at intervals of five days, the intervening days being